On December 20 the wind at 4 p.m. was S., 6 miles per hour at the surface, but increased rapidly with altitude to 68 miles per hour at 3,800 feet. However, the light surface wind shifted to N. from 5 to 7:30 p.m., when the strong southwest wind began.

On December 21 the wind was ENE., 14 miles per hour, at the surface, SW., 29 miles per hour, at 1,500 feet elevation, and 82 miles per hour at 7,400 feet above the ground. The strong southwest wind set in at 11:30 p.m.

On December 29 at 4 a.m. the wind was ENE., 2 miles per hour at the surface; WSW., 33 miles per hour at 1,500 feet elevation, and W. at the surface at about 1:30 p.m. The temperature and humidity of these winds aloft would be interesting.

THE JANUARY 1934 COLD WAVE ON MOUNT WASHINGTON, N.H.

By SALVATORE PAGLIUCA

[Mount Washington Observatory, Gorham, N.H., Feb. 15, 1934]

The cold wave of January 29, 1934, hit Mount Washington with extreme severity. The preceding day, January 28, was characterized by relatively mild conditions, the temperature having risen during the day to a maximum of 22.6° F., with a 54- to 63-mi/hr wind of prevailing SW. direction. It snowed all day, with a total precipitation of 0.19 inch from 8 a.m. to 8 p.m. Also the summit was in dense, rime-forming fog all day.

The pressure was unusually low and steadily falling, as the center of a low-pressure area moving eastward passed slightly north of Mount Washington.

Shortly after 3 p.m. the temperature took a downward trend followed by gradual shifts in wind direction to the WSW., W., and WNW. The wind steadily increased to an average velocity of 80 mi/hr at 10 p.m., when a major drop in temperature took place, shortly followed by a further shift in wind to the NW. With a temperature of 5° below zero at midnight, a total drop of 20° had occurred in the previous 4 hours. (See fig. 1.)

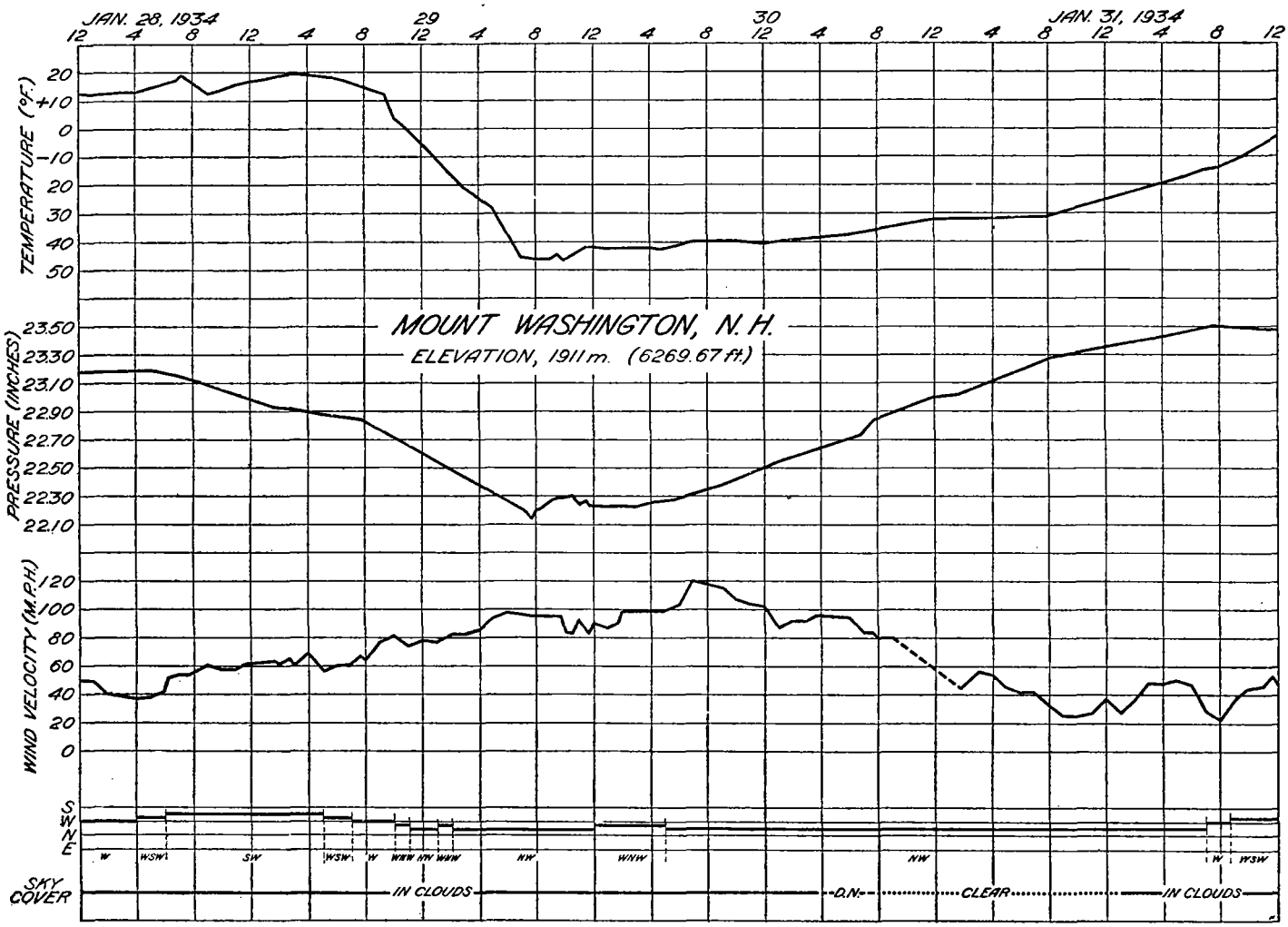

FIGURE 1.—The cold wave of Jan. 28-30, 1934, on Mount Washington, N.H. (1,911 meters or 6,270 feet above m.s.l.) Drawn by Wendell Stephenson, Mount Washington Observatory.

From 3 a.m. to 7 a.m. January 29, the temperature dropped 25° more to 45.5° below zero. From 7 a.m. to 10 a.m. the temperature was oscillating about −46°, with a minimum of −46.5°, read at 10 a.m. A pressure of 22.187 inches (reduced to sea level, 29.35 inches) was noted on the mercurial barometer at 7:40 a.m., but barograph traces indicate that at 7:15 a.m. the pressure was nearly 22.15 inches.

The wind which had been averaging 80 to 95 mi/hr, increased in velocity and gustiness to nearly 100 mi/hr early in the afternoon, reaching a maximum of 120 mi/hr at 7 p.m. The wind direction was WNW. from 12 noon to 5 p.m. when it shifted again to NW.

The temperature averaged −40° F. until 1 a.m., January 30, when it took an upward trend. The pressure remained low all day January 29, the barograms showing high amplitude oscillations of the order of 0.15 inch. At 8 p.m. the pressure started to rise.

The summit was in fog all day, but rime was not forming to any appreciable extent. A very thin, whitish film would deposit on a thermometer after 4 or 5 minutes' exposure, but it was not enough to obscure the spirit column or the graduation. It was hard to determine whether the deposit originated from minute undercooled water droplets or snow or ice particles.

On January 30, the temperature rose gradually during the morning. It was practically steady in the afternoon, and at 8 p.m. started to rise again. The pressure rose rapidly during the day. The NW. wind gradually decreased in velocity to 25 mi/hr late in the evening. It was clear, with visibility 9 all day, the only cloud being a small Altocumulus lenticularis to the northeast of the summit in the early morning. Fractocumulus clouds of peculiar cumulus appearance were forming at 1,800 meters on the west side of the mountain, the top occasionally reaching the summit level.

January 31 marked the end of this severe cold wave as the temperature reached −4° F. at noon and continued to rise in the afternoon. The temperature of −46.5° F. recorded at 10 a.m. January 29, and the pressure of 22.187 inches by mercurial barometer, and 22.15 inches by barographs, recorded the same morning at 7:40 a.m. and 7:15 a.m. respectively, are the lowest since the establishment of the present observatory (October 1932).

Temperatures were measured with standard alcohol thermometers, and continuously recorded by means of thermographs of the Bourdon tube type. Mercurial thermometers became sluggish at about −30° F. and were useless at lower temperatures. The wind movement was continuously recorded by means of an electrically heated anemometer of special design. Pressure measurement was obtained with a standard mercurial barometer and also with both a mercurial and an aneroid barograph.

Some of the observers, equipped with windproof clothing, were exposed to the extreme combination of 100–120 miles an hour wind and 43° below zero for nearly 1 hour without experiencing any physical discomfort. During the whole period that the cold wave lasted, minor nose frost bites resulted, no more painful than ordinary sunburns.

STORMS OVER THE NORTHEAST PACIFIC OCEAN AND ADJACENT LAND AREAS IN DECEMBER 1933

By R. C. COUNTS, JR.

[Weather Bureau office, San Francisco, Calif., February 1934]

The weather in the far Western States during December 1933, was characterized by an excess of precipitation and abnormally high mean temperatures, except in California where the mean temperature approximated the normal. Precipitation averaged nearly 21 inches in the western portion of Washington and Oregon, establishing a new record for the month, while in the eastern portion of each of these States and also in Idaho, the average has been exceeded in few previous years. Serious flood conditions with the attendant devastation and isolation of communities over a large part of Washington and northwestern Oregon resulted from these exceptionally heavy rains. The number of cloudy and rainy days also established some new records. The mean temperature was the highest of record for December in Oregon and it was one of the mildest Decembers of record in Washington, Idaho, and Nevada. These mild temperatures and heavy rains melted the mountain snows, the run-off of which, along with the high tides caused by strong winds over land and offshore, aggravated the flood condition. On the last day of the month rains deluged an area in southern California between the coast and the San Gabriel and upper ranges of the San Bernardino Mountains, flooding the Los Angeles area and breaking records in that section for the heaviest rainfall in 24 hours. The largest amount was 13.42 inches at Glendale. The cause of these phenomenal rains necessarily requires at least a brief outline of the storm movements and anomalous distributions of the various air masses over the northeast Pacific and the adjacent portion of this continent.

Throughout the greater part of the month a mass of cold air overlay Bering Sea and Alaska, and extended southeastward over Canada and the eastern portion of this country. However, the part over the Eastern States broke off at times from the larger air mass and moved on, giving place to warmer air during the eastward passage of a depression. On the first 18 days this mass was charted from the Bering Sea southward or southeastward over the ocean, quite often reaching the California coast, and after the first few days covered the Gulf of Alaska during the remainder of the month. The extent and intensity of this polar air mass were such that pressures at all stations on the coast of Alaska and British Columbia were far above normal while temperatures were correspondingly as far below normal. Pressures over California and the Southwest were relatively high although about normal, but Washington and Oregon, situated on or near the most frequented storm path, showed subnormal pressures and a decided excess in temperature. Winds at Juneau, Alaska, between the 8,000 and 14,000 foot levels, except during a few days in the first week, were nearly northwest and usually of gale force. Winds of this character over Juneau, and cold air spreading from Alaska out over the ocean to approximately latitude 50°, precluded the possibility of cyclonic development over the Gulf of Alaska. The result was that the mean path of storms over the northeast Pacific was displaced far to the south of the normal storm path. With a few exceptions during the opening days of the month the path lay south of latitude 50°, but on every occasion the storm track onto the continent was along or near the Washington-British Columbia border.

Normally, the marked contrast between the polar air and the warmer air over the ocean is near the Alaskan and Canadian coastline and it is along this line of discontinuity that cyclones are so frequently generated and near which those moving from a region in higher latitudes farther west establish a path. In December 1933, with the drainage of cold air southward the surface of discontinuity was, of course, established 10° to 20° in latitude farther south over the ocean, and occasionally when the cold air reached from Bering Sea to latitude 30° this surface of contrasting temperatures was appearing in rather low latitudes. The dynamic equilibrium of these masses of air flowing side by side in opposite directions could not be maintained and cyclones having their in-